

Date: Tuesday, 1/15/2008 3:08:48 PM
 User: Kim Johnston

Process Sheet

Customer : CU-DAR001 Dart Helicopters Services Drawing Name : 412 X-TUBE ,LOW NARROW AFT
 Job Number : 36771
 Estimate Number : 13020
 P.O. Number :
 This Issue : 1/15/2008 S.O. No. :
 Prsht Rev. : NC Part Number : D412664209
 First Issue : 1/15/2008 Type : LANDING GEAR Drawing Number : D412-664-209-~~UR~~ A
 Previous Run : 36770 Drawing Revision : ~~UR~~ A
 Material :
 Due Date : 2/4/2008 Qty: 1 Um: Each
 Written By :
 Checked & Approved By :
 Comment : Est Rev:A New Issue 07.09.12 EC verified by: JLM
 Est Rev:B ECN 1100 08-01-11 DD verified by EC

Additional Product

Job Number:

Seq. #: Machine Or Operation: Description :

1.0 DC DOCUMENT CONTROL

Comment: DOCUMENT CONTROL

Photocopy bluefile and create labels as per PPP D212-664-209 CHG001

2.0 D6008132P Crosstube extrusion

Comment: Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

Pick:

Qty Part number Description Batch

1 D6008-132 Crosstube

Check OD = 3.250" ID = 2.375" 3.500" x ID 2.250

3.0 MORI SEIKI MORI SEIKI CNC LATHE LARGE

Comment: 1-TURN AS PER FOLIO FA708 & DWG D412-664-249,

FOLIO REV: AA

DWG REV: A

2-DEBURR AS REQUIRED

4.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE

Comment: INSPECT PARTS AS THEY COME OFF MACHINE

5.0 QC8 SECOND CHECK

Comment: SECOND CHECK

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
08/01/25	10	Height is 18.14" (0.106" OVER TOL) • ONE WIDTH IS 48.42" (0.13" UNDER TOL)	CP 08/01/25 PC 08/04/25	Tube is acceptable	EL 8-1-25	08/01/25	CP 08/01/25 PC 08/04/25	08/01/25

NOTE: Date & initial all entries

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Drawing Name: 412 X-TUBE LOW NARROW AFT

Job Number: 36771

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description:

6.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



AWM
04-01-21



Comment: LANDING GEAR RESOURCE 1

1-Polish entire outside surface of crosstube

7.0

QC5

INSPECT WORK TO CURRENT STEP



DP
8-1-22



Comment: INSPECT WORK TO CURRENT STEP

8.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

JP 8-1-22

9.0

QC3/5

INSPECT WORK/WING WALK



DP



Comment: Inspect work & Chemical conversion Coat

8-1-22

10.0

BENDING

BENDING MACHINE



Comment: BENDING MACHINE

Bend tube as per Dwg D412-664-249 using CNC bender program and Folio FT

EL/JP 8-1-25

11.0

QC6

DIMENSIONAL CHECK



Comment: DIMENSIONAL CHECK

JP 08.025 (1)

12.0

D36601

CUFF



Comment: Qty: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)

CUFF

Batch:

B36651

DP 8-1-25

13.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Drill Rivet holes as per Dwg D412-664-249

2-Drill pilot holes in tube as per Dwg D412-664-249

3-Ream hole to finish size in tube as per Dwg D412-664-249

DP
8-1-25

W/O:		WORK ORDER CHANGES					
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Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

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Process Sheet

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Drawing Name: 412 X-TUBE ,LOW NARROW AFT

Job Number: 36771

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description :

4-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-249

JD 8-1-20

14.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat Tube & Cuffs as per QSI 005 4.1

JD 8-1-21

15.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

0861/31 (40)

16.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

0861/31 (40)

17.0

OUTSIDE SERV.10

OUTSIDE SERVICES -LG



Comment: Sub-Contracting OUTSIDE SERVICES

Liquid Penetrant Inspection as per QSI 038

Issue P/O: 5590 LPI as per ASTM 1417

Level 2 Attach copy of NDT results to work order

CD081021040

18.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Inspect for transit damage

Ensure copy of NDT results attached to work order.

PC 8/2/01 (10)

19.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: Inspect for damage & ensure results are as per Dwg D412-664-203

08/02/04

20.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Rivet Cuffs as per Dwg D412-664-249. with Sika flex in Between tube & Cuff

A/R: SIKAFLEX -241/-291

BATCH:

M1 05478

EXP. 8-7-30

M

8-2-5

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

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User: Kim Johnston

Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: 412 X-TUBE LOW NARROW AFT

Job Number: 36771

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description :

21.0

CR3212407

CHERRY RIVET



Comment: Qty.: 44.0000 Each(s)/Unit Total : 44.0000 Each(s)

CHERRY RIVET

Batch: 1404071

(50)

11

3-8-5

22.0

SPRAY PAINTING

SPRAY PAINTING



Comment: SPRAY PAINTING

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per QSI 005 4.2

RT 08-02-05

23.0

QC14

INSPECT SPRAY PAINT



Comment: Inspect Spray Paint

Wrap in plastic bag to protect from scratches

11 08/02/06

(1)

24.0

D28961

Support



Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)

Support

Batch: 30200

RT 08-02-11

25.0

D31891

Chafing Shield



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

Chafing Shield

Batch: 36065

RT 08-02-11

26.0

D3595

Rubber Cushion (per sq ft)



Comment: Qty.: 0.0263 sf(s)/Unit Total : 0.0263 sf(s)

Rubber Cushion

Cut to .630" X 5.70" Qty 2

Batch: 35126

RT 08-02-11

27.0

MS2192028

Clamp(per MIL-DTL-8783C)



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Clamp

Batch: 106864

RT 08-02-11

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: 412 X-TUBE LOW NARROW AFT

Job Number: 36771

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description:

28.0

MS2192030

clamp(per MIL-DTL-8783C)



Comment: Qty.: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)
clamp(per MIL-DTL-8783C)

106 810

BT 08-02-11

29.0

D28566001009

Abrasion strip



Comment: Qty.: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)
Abrasion strip
batch 36398

BT 08-02-11

30.0

AN640A

Bolt



Comment: Qty.: 4.0000 Each(s)/Unit Total: 4.0000 Each(s)
Bolt
batch

31.0

AN641A

Bolt



Comment: Qty.: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)
Bolt

32.0

MS21042L6

Nut



Comment: Qty.: 6.0000 Each(s)/Unit Total: 6.0000 Each(s)
Nut
batch

33.0

AN960JD616

Washer



Comment: Qty.: 18.0000 Each(s)/Unit Total: 18.0000 Each(s)
Washer
batch

34.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1
Assemble as per Dwg D412-664-249

Instal support with magnobond 6398 per dwg D412-664-249,
cure for 12hrs before packaging.

BT 08-02-11

BT 08-02-11

Time & date of application: 2:00 08-02-11

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
08/02/12	#	inspect QC #5 for Assembly End for QC #5 pick kit. &	J	08/02/12	(1)		J 08/02/12

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

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Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: 412 X-TUBE ,LOW NARROW AFT

Job Number: 36771

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description :

Batch: _____

35.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

36.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Identify and pack for shipping as per PPP D412-664-209

HA1

37.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

08-02-12

Job Completion



u 08-02-12

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD	Work Order: 36771
Description: Crosstube Assembly (412 Low Aft)	Part Number: D412-664-249
Inspection Dwg: D412-664-249 Rev: A	Page 1 of 1

FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article
 ☐ Prototype

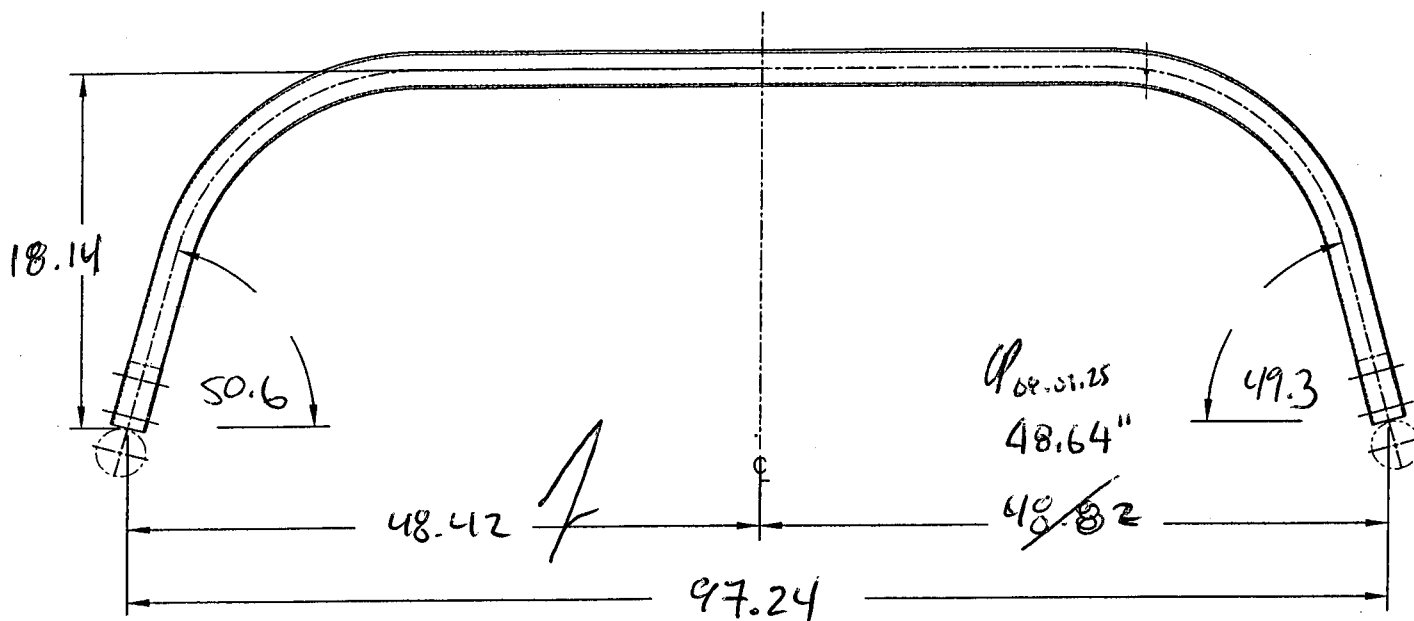
	Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	Ø 2.680"	+ .005 - .000	Ø 2.683"	✓			
	Ø 2.687"	+ .005 - .000	Ø 2.691"	✓			
	Ø 2.793"	+ .005 - .000	Ø 2.797"	✓			
	Ø 2.930"	+ .005 - .000	Ø 2.934"	✓			
	Ø 3.067"	+ .005 - .000	Ø 3.070"	✓			
	Ø 3.205"	+ .005 - .000	3.207"	✓			
	Ø 3.358"	+ .005 - .000	3.359"	✓			
SIDE B	127.82"	± .020"	127.82"	✓			
	Ø 2.680"	+ .005 - .000	2.682	✓			
	Ø 2.687"	+ .005 - .000	2.689	✓			
	Ø 2.793"	+ .005 - .000	2.795	✓			
	Ø 2.930"	+ .005 - .000	2.933	✓			
	Ø 3.067"	+ .005 - .000	3.069	✓			
	Ø 3.205"	+ .005 - .000	3.207	✓			
	Ø 3.358"	+ .005 - .000	3.359	✓			

Measured by: J.F. [Signature]	Audited by: [Signature]	Prototype Approval:	N/A
Date: 08-01-19	Date: 08/01/21	Date:	N/A

Rev	Date	Change	Revised by	Approved
A		New Issue (P/O D212-664-209)	KJ/EC/DD	

DART AEROSPACE LTD		Work Order:	36771
Description: Crosstube Low Aft (412)		Part Number:	D212-664-209
Inspection Dwg: D212-664-249 Rev: A		Page 1 of 1	

Required Dimension	Min	Max
Height	17.78	18.04
1/2 Span	48.55	48.81
Angle	49	52
Total Span	97.1	97.62



Comments
height is high.

QC15 Inspection	08.01.25
Date	

Rev	Date	Change	Revised by	Approved
A		New Issue		

PARTS LIST:

Qty	Part Number	Description
X	D412-664-249	CROSSTUBE ASSEMBLY (412 LOW AFT)
1	D6009-129	CROSSTUBE
2	D2856-600-1009	ABRASION STRIP
1	D2896-1	SUPPORT
2	D3189-1	CHAFING SHIELD
2	D3595-063-570	RUBBER CUSHION
2	D3660-1	CUFF
44	CR3212-4-07	RIVET (OR M7885/3-4-07)
4	MS21920-28	CLAMP
2	MS21920-30	CLAMP (OR MS21920-32)
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)
A/R	SIKAFLEX-241/-291	SEALANT (OR PROSEAL 890 OR MIL-S-8802 CLASS B2 SEALANT)

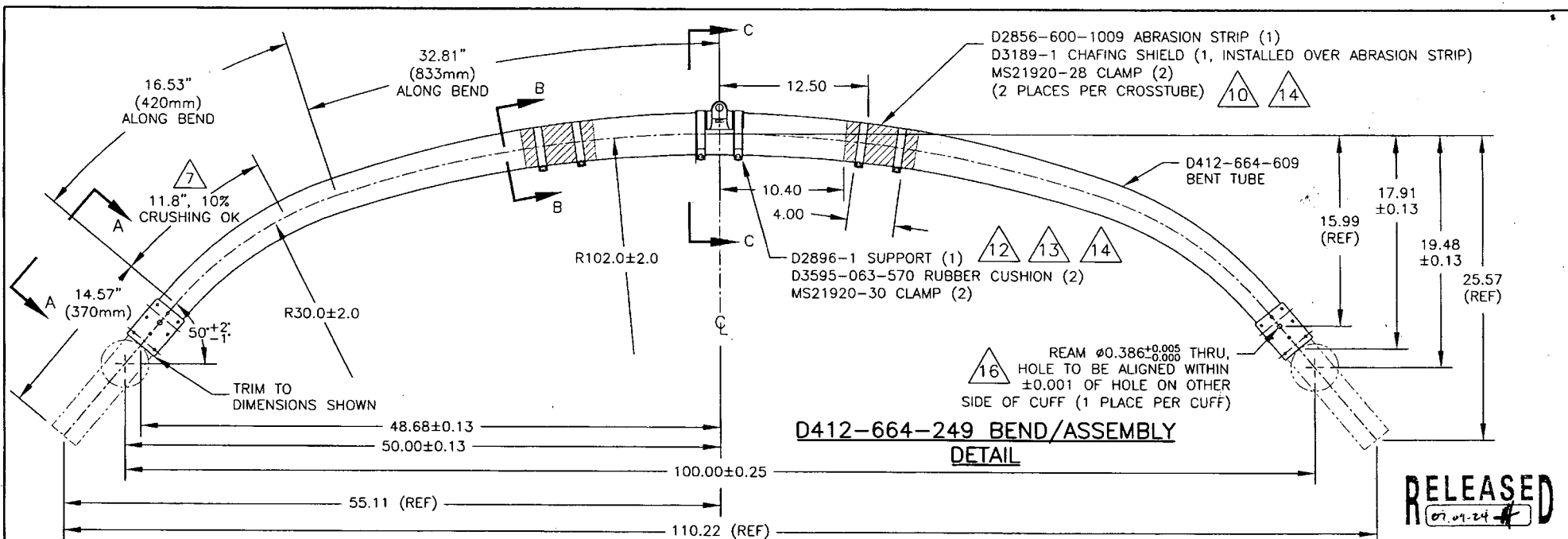
GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6009-129
FINISHED LENGTH = 127.82±0.020 (BEFORE BENDING/TRIMMING)
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) ALL DIMENSIONS ARE IN INCHES
- 5) PART IS SYMMETRIC ABOUT CENTERLINE.
- 6) WHEN MACHINING TAPER, RUN-OFF PART AT STOCK. BLEND OUT EDGE LONGITUDINALLY,
TRANSITION SHOULD BE SMOOTH.
- 7) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE
TO BENDING IS 6% BASED ON O.D., EXCEPT UP TO 10% IS ALLOWED IN AREA NOTED.
- 8) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 9) SCRIBE DART PART NUMBER AND BATCH NUMBER ON INNER SURFACE OF TUBE WITH A
VIBRATING STYLUS.
- 10) INSTALL D2856-600-1009 ABRASION STRIP WITH A 0.13 (REF) GAP ON BOTTOM SIDE OF
CROSSTUBE PER QSI 035.
- 11) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS
SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT
LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 12) APPLY A 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1
THAT WILL BE IN CONTACT WITH THE CROSSTUBE. LET CURE FOR 12 HOURS AFTER
INSTALLATION AND PRIOR TO PACKAGING.
- 13) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE
D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE
CROSSTUBE SUPPORT.
- 14) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY
AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) INSTALL D3660-1 CUFF AFTER CHEMICAL CONVERSION COAT BUT BEFORE PAINT, WITH A
LAYER OF SIKAFLEX-241/-291 OR PROSEAL 890 OR MIL-S-8802 CLASS B2 SEALANT BETWEEN
CUFF AND CROSSTUBE. SEAL EDGE OF CUFF TO ENSURE NO GAPS.
- 16) TOUCH-UP HOLES WITH CHEMICAL CONVERSION COAT.

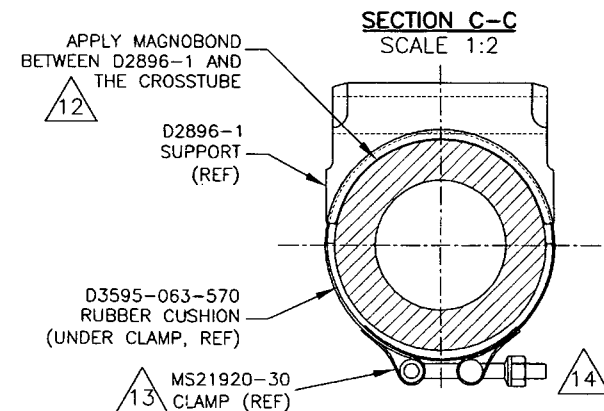
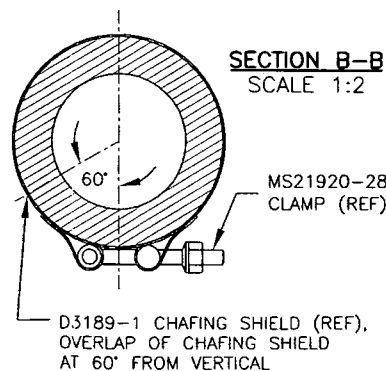
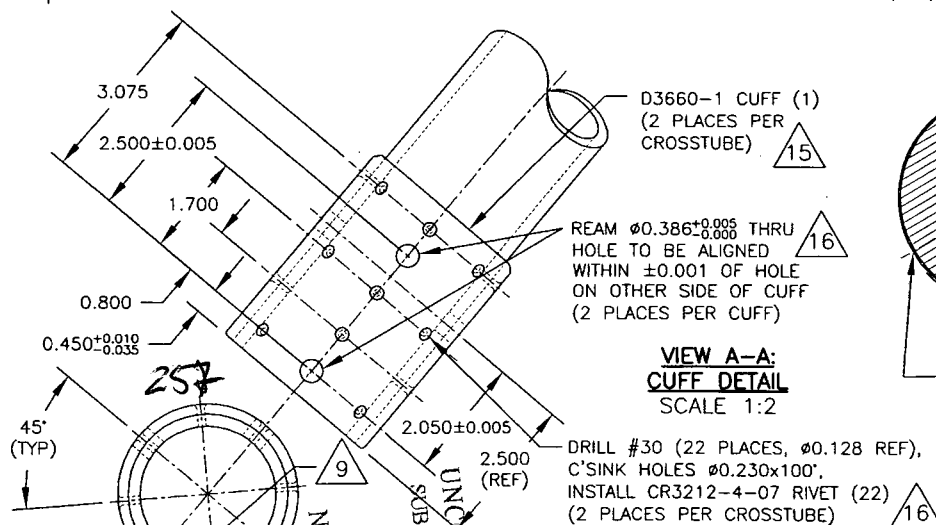
RELEASED
07.04.24

NO. 36771
WORK ORDER
SUBJECT TO AMENDMENT
WITHOUT NOTICE
UNCONTROLLED COPY
RETURN TO
ENGINEERING
SHOP COPY

A	07.07.07	NEW ISSUE
DESIGN	90	DRAWN BY 90
CHECKED	90	APPROVED
DATE	07.07.07	
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DART AEROSPACE LTD. HAWKESBURY, ONTARIO, CANADA		
DRAWING NO. 0412-664-249		REV. A
TITLE CROSSTUBE (412 LOW AFT)		SHEET 1 OF 3
		SCALE
		NTS



RELEASED
07.07.24



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DESIGN	40	DRAWN BY	40	DART	DART AEROSPACE LTD. HAMPSHIRE, ONTARIO, CANADA
CHECKED	24	APPROVED	24	DRAWING NO.	0412-664-249
DATE	07.07.07	TITLE	CROSSTUBE (412 LOW AFT)	REV. A	SHEET 2 OF 3
				SCALE	1:8

NO. 362711

WORK ORDER

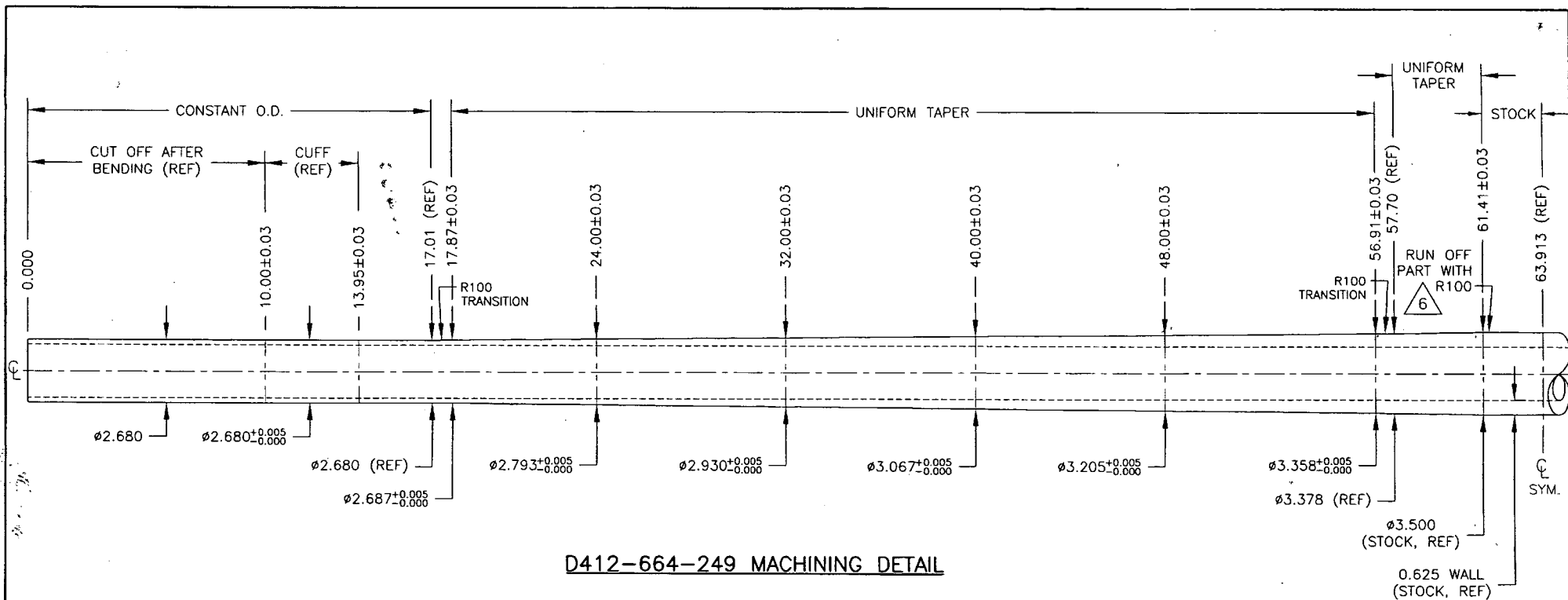
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ENGINEERING

REVIEW TO

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07.356



D412-664-249 MACHINING DETAIL

RELEASED
07.09.24

NO. 36771
WORK ORDER
UNCONTROLLED COPY
ENGINEERING
RETURN TO
SUBJECT TO AMENDMENT
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DATE		07.07.07		DRAWING NO.	REV. A
				D412-664-249	SHEET 3 OF 3
				TITLE	SCALE
				CROSSTUBE (412 LOW AFT)	1:4



LIQUID PENETRANT TEST REPORT

P- 09829

PAGE 1 OF 1

TIME AM ☐ PM ☐

CLIENT Def Aerospace DATE Feb 01 2008

ATTENTION Linda Lacelle ACUREN JOB NO. _____

ADDRESS 1270 Aberdeen St, Hawkesbury PO/VO NO. _____

ONT. WORK LOCATION Hawkesbury

ACCEPTANCE STD. ASTM 1417/AS1-03 REV./DATE 2005

PROJECT Job # 34637, 36377, 36769, 36771

ITEM(S) EXAMINED 212 X-TUBE, LOW NARROW FWD - 206 L FWD X-TUBE, 412 X-TUBE LOW

NARROW APT, 412 X-TUBE, LOW NARROW APT

JOB DESCRIPTION _____ PROCEDURE NO. LT-0002 REV./DATE _____

PART NO. D212664147, D206667103, D412664201 MATERIAL _____ THICKNESS _____

SCOPE WET FLOUORESCENT LIQUID PENETRANT INSPECTION CARRIED OUT ON 100%

OF EXTERNAL SURFACE

TEST DETAILS

METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED

FAMILY BRAND MAGNAFLUX BLACK LIGHT S/N 8178 ☒ OUTPUT > 1000 μ W/cm² ☒ AMBIENT < 2 fc

PENETRANT ZLC7 MINIMUM DWELL TIME 40-45 MIN. LIGHTING EQUIP. ☒ FLASHLIGHT ☐ TROUBLELIGHT ☒ OUTPUT > 100 fc @ SURFACE

PENETRANT REMOVER H2O MINIMUM DRY TIME >10 MIN. OTHER _____ CAL DUE DATE MAR 08

DEVELOPER MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N _____

DEVELOPER TYPE ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE

SURFACE CONDITION ☒ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☐ CLEAN BARE METAL

SURFACE TEMPERATURE ☐ < - 4°C/ 20°F ☐ - 4°C/ 20°F TO 10°C/50°F ☒ 10°C/50°F TO 52°C/125°F ☐ > 52°C/125°F

RESULTS- (☐ METRIC ☐ IMPERIAL)

ITEM	COMMENTS	ACCEPT	REJECT
34637	: ACCEPTABLE		
36377	: ACCEPTABLE		
36769	: ACCEPTABLE		
36771	: ACCEPTABLE		

WHITE - CLIENT COPY

CANARY - OFFICE COPY

PINK - TECHNICIAN COPY

GOLD - OFFICE COPY

PT Sept 2005